



# Convection-Anvil and Thin-Cirrus Simulations by a Cloud-Resolving NWP Model: Some Preliminary Results

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## Motivation

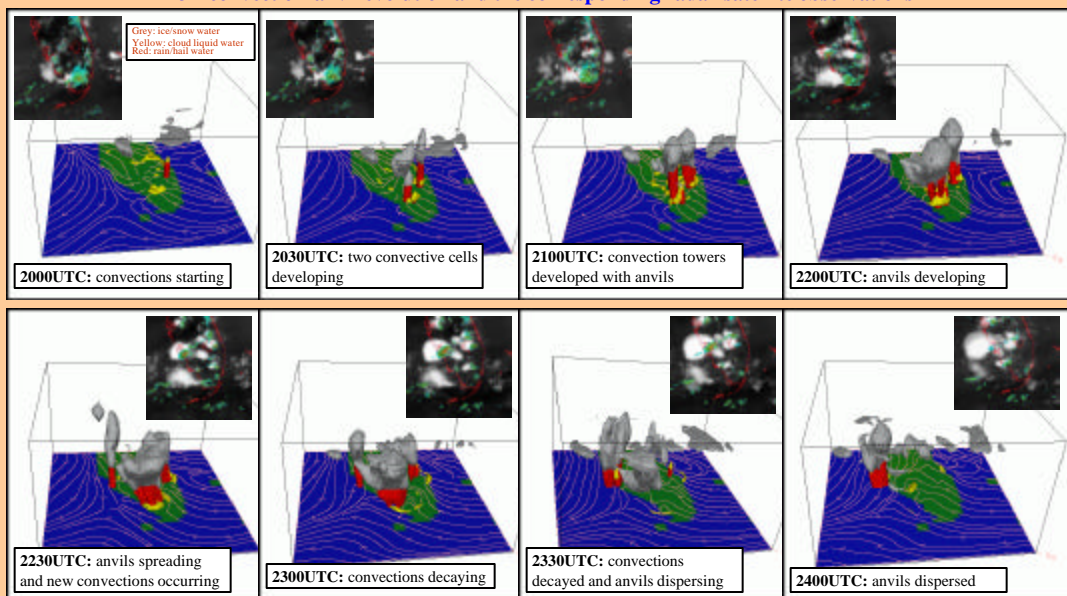
- To understand convection-anvil and thin-cirrus/tropopause-cirrus properties and physical processes by modeling.
- To examine the formation and evolution of these cloud systems and their interaction and feedback processes with radiation, microphysics, dynamics, and thermodynamics.
- To validate and improve parameterization of cirrus cloud in weather/global models.

## Cloud-Resolving NWP Model and Configuration

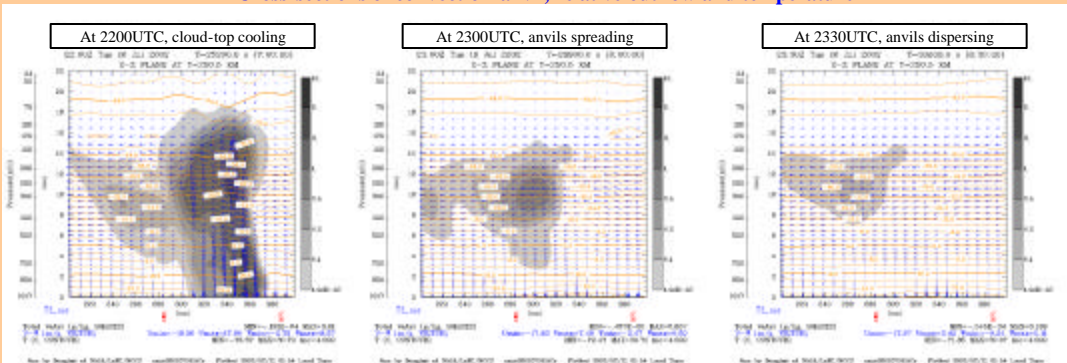
- The model used is the Advanced Regional Prediction System (ARPS). It is a multi-purpose modeling system capable of multi-scale numerical weather prediction (NWP) ranging from cloud-scale to larger regional scale.
- The model contains detailed interactive physics for explicit cloud-resolving, e.g., cloud-radiation interactive package, cloud microphysics, advanced turbulence scheme, and land surface effect et al.
- In this study, two one-way nested 15/3 km grids are employed over the CRYSTAL-FACE area. We will focus on the 3-km domain covering 600 x 600 km<sup>2</sup> in horizontal and 25 km in vertical.

## The Simulated Convection-Anvil of July 16

### 3D convection-anvil evolution and the corresponding radar-satellite observations



### Cross-sections of convection-anvil, relative outflow and temperature



## Next Steps

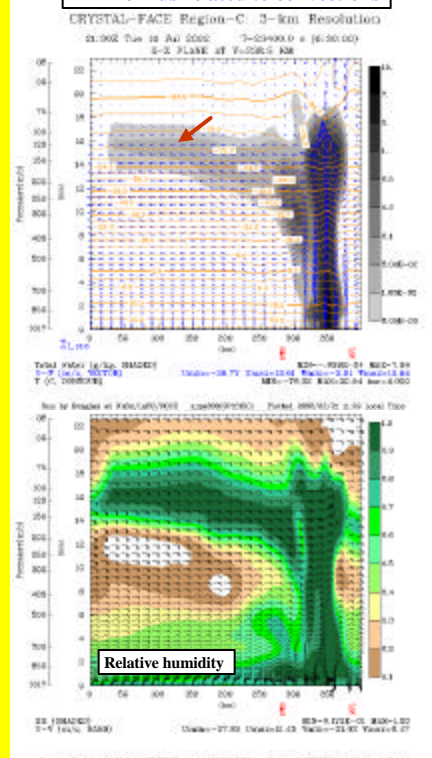
- Deeply analyze the simulated data for understanding the formation/maintain physical mechanisms of anvils/cirrus, and the influence on radiative heating and cooling as well as the column radiation budget.
- Higher resolution (~1 km) simulations and some sensitivity experiments.
- Objective validation/comparison of the simulations with the field measurements.
- To compute the related optical properties.
- To test and improve the model cloud microphysics.

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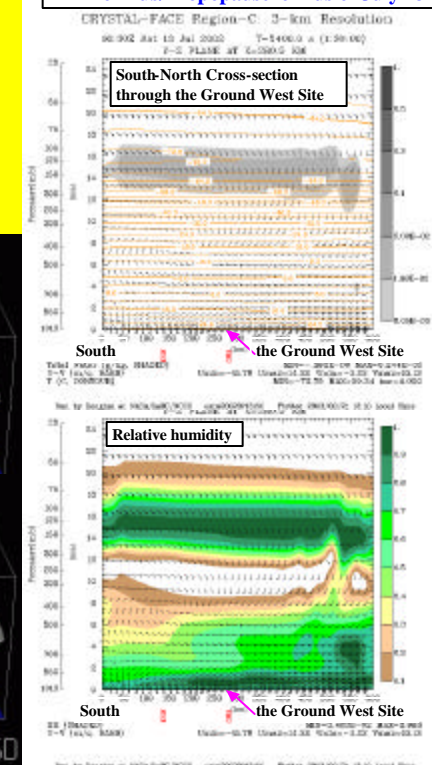
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## The Simulated Thin-Cirrus

### Thin-cirrus related to convections



### Thin-cirrus/Tropopause-cirrus of July 13



### 3D isosurface view at 1630 UTC

